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Detection of alcohol consumption in suicides

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Abstract Screening instruments for detection of alcohol consumption, abuse, and dependence for use in psychological autopsy studies with case control design are not validated. Therefore, interrater and test-retest reliability of the Luebeck Alcohol Dependence and Abuse Screening Test (LAST) and the usability of this test for the psychological autopsy method were investigated. Alcohol consumption was evaluated by a semi-structured interview including the Structured Clinical Interview for DSM-IV Axis I (SCID-I) and the LAST in 163 completed suicides (mean age 49.6 ± 19.3 years; 64.4% men) and by personal interview in 396 population-based controls (mean age 51.6 ± 17.0 years; 55.8% men). Of the controls, 35 were additionally assessed by interviewing informants; these results were compared with those generated by personal interview. Comparison of LAST scores by personal and informant's interview of controls generated a Spearman correlation coefficient of 0.74 ($P < 0.0001$). The LAST (7 item-version, cut-off of 2) revealed high sensitivity and specificity for alcohol abuse and dependence, in both controls and suicides. LAST scores were significantly associated with high, frequent, and hazardous alcohol consumption ($P < 0.001$) in suicides. Our findings provide support for reliability and validity of identifying individuals with alcohol dependence and abuse obtained through the best-estimate method using the LAST. This 7-item questionnaire can be recommended as a useful tool for the psychological autopsy procedure in postmortem research.

Key words alcoholism · suicide · postmortem diagnoses · screening instruments

Introduction

Case control studies using the psychological autopsy method have identified alcohol use disorders as risk factors for suicide (Brent et al. 1993; Lesage et al. 1994; Cheng 1995; Foster et al. 1999; Vijayakumar and Rajkumar 1999; Waern 2003). Even though alcohol dependence has a high lifetime suicide rate of about 7% (Inskip et al. 1998) and alcoholism is one of the most frequently found psychiatric disorders in suicides in psychological autopsy studies (up to 56%; Conwell et al. 1996), there is a scarcity of data on how to detect alcohol abuse and alcohol dependence in suicides postmortem. At present, genetic studies cannot reveal alcohol-related disorders and alcoholism-related subtypes unequivocally (Schmidt et al. 2002; Preuss et al. 2003). Laboratory parameters like carbohydrate-deficient transferrin (CDT), gamma-glutamyltransferase (γ -GT) or homocysteine are often recommended to screen for alcohol consumption; however, these parameters showed only low sensitivity and low positive predictive values, which is especially the case for CDT in women (Wetterling et al. 1998; Siegfried et al. 2001; Bleich et al. 2001). CDT, a marker of ante-mortem alcohol use prior to time of death (Malcolm et al. 1999), cannot provide lifetime diagnoses of alcohol-related disorders.

The interview applied in the National Suicide Prevention Project in Finland (IMS-87; Henriksson et al. 1993) contains one section for assessing alcohol consumption. Using a screening instrument for detecting alcohol abuse and dependence reduces the time-consuming process of diagnosing and facilitates assessing the levels of alcohol consumption in suicides. Two self-rating tests, the CAGE (Mayfield et al. 1974) and the Michigan Alcoholism Screening Test (MAST; Selzer 1971), are commonly used for screening for lifetime alcohol abuse. MAST and CAGE showed higher validity

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than laboratory tests (Bernadt et al. 1982; Beresford et al. 1990) and were recommended as the best screening method for general population samples. Based on item analysis, the best items of both tests were compiled in a new instrument, the Luebeck Alcohol Dependence and Abuse Screening Test (LAST), which detects lifetime alcohol dependence or abuse with very high sensitivity (Rumpf et al. 1997). At the moment, however, screening tests for alcohol abuse are developed only for personal interview of targeted individuals and not for interviewing informants. But the validity of screening instruments by using the psychological autopsy method is a critical issue. The method referred to as the “psychological autopsy” (Hawton et al. 1998) when used in post-mortem research, is the best-estimate method by which psychiatric diagnoses can be reliably and validly made (Leckman et al. 1982).

In order to evaluate the validity of the LAST in the estimation of alcohol consumption of suicides post-mortem, our study has the following objectives: (1) to determine the reliability of the LAST, (2) to compare LAST scores by best-estimate method with the scores generated by personal interview, (3) and with diagnoses of alcohol use disorders generated by SCID-I in suicides and controls, and with the items for alcohol use of the interview applied in the National Suicide Prevention Project in Finland, and (4) to compare alcohol consumption in suicides and controls.

Methods

All 263 suicides (mean age 50.9 ± 19.6 years; 66.2% males) who died in the Frankfurt/Main area (population about one million inhabitants) in 1999 and 2000 were included in the study. The relatives of 163 suicides (mean age 49.8 ± 19.3 years; 64.4% males; = sample 1) were interviewed using the psychological autopsy method with a semi-structured interview (see below). In addition, out of 685 population-based controls contacted, 396 persons (mean age 51.6 ± 17.0 years; 55.8% males; = sample 2), who were comparable to the suicides regarding residential area, age, and gender, were personally questioned. The controls were chosen by “random digit dialling”. The suicides’ relatives and the control persons were contacted by mail, introducing them to the research project. All potential informants were told that the participation was voluntary. Control persons were also asked to give their consent for repetition of the interview, for interviews by two interviewers and for asking a close relative or friend to give an interview about the control person himself or herself. The study protocol was approved by the ethics’ committee of the Medical Faculty of the University of Frankfurt/Main.

Out of the 396 control persons, we asked 49 subjects for an interview by two raters, another 49 persons for a second interview, and another 49 for their consent for interviewing a relative; each group was selected out of the whole control sample by “random numbers”. If these control persons and his or her next-of-kin agreed to participate, they were included in the assessment of reliability and validity of the instruments of the study. A total of 33 persons (mean age 48.4 ± 17.2 years; 51.5% men) were interviewed by two interviewers on the same day for assessing interrater reliability. Interviews of 29 control persons (mean age 51.8 ± 17.2 years; 62.1% men) were repeated for assessment of test-retest reliability in an interval of 78.5 ± 53 (mean \pm S.D.) days. Interviews of 35 controls (mean age 49.5 ± 15.2 years; 65.7% men) were conducted directly with them and also with their next of kin or friends by a second rater masked to the results of the personal interview. Informants of the control persons were spouses

(63%), adult children (17%), sisters (11%), brother, mother, and close friend (3%, each). Interrater reliability, test-retest reliability and agreement between personal and informant’s interview for diagnoses of substance-related disorders were measured using kappa statistics (Fleiss 1981) and were found to be good ($\kappa \geq 0.84$, Schneider et al. 2004).

A semi-structured interview, a modified and translated version of the interview applied in the National Suicide Prevention Project in Finland (IMS-87) containing a section which assesses use of alcohol with ordinal scale questions among others (the complete section only in suicides), the Structured Clinical Interview for DSM-IV Axis I (SCID-I, German version, Wittchen et al. 1997), and the Luebeck Alcohol Dependence and Abuse Screening Test (LAST; Rumpf et al. 1997) were carried out with control persons and with informants about the suicide cases. The LAST (Rumpf et al. 1997), was used to assess “problematic” alcohol consumption. A person was classified to have misused alcohol or be dependent on alcohol if he/she received a total score of at least two, the cut-off point which Rumpf et al. (1997) had achieved as a good validity measure.

The statistical analysis (non-parametrical tests) was performed using an SPSS program package, Version 10 (Chicago, USA). Intraclass correlation coefficients were used to evaluate interrater and test-retest reliability; Spearman correlation coefficients for correlation of informant-based and subject-based information of the LAST. To estimate LAST scores (cut-off of two points) to identify alcohol abuse or dependence (DSM-IV), sensitivity, specificity, predictive values and receiver operating characteristics (ROC) curves were calculated for the different groups. Chi square analyses, Mann-Whitney U-Test, and Kendall’s tau-b were used to determine the association between LAST scores and the scores of the items of quantity and frequency of alcohol consumption of the interview applied in the National Suicide Prevention Project in Finland. Significance level was designated as $P < 0.05$.

Results

■ Interrater and test-retest reliability and scores by personal and informant’s interview of the LAST (7-item version)

There are two versions of the Luebeck Alcohol Dependence and Abuse Screening Test (LAST), a 7-item version and a 9-item version (Rumpf et al. 1997). The use of both versions revealed nearly identical results with only marginal differences; therefore only the data of the 7-item version are presented. Three parameters were calculated for the LAST scores: (1) correlation between report of the interviewee him/herself and a close person, (2) interrater reliability, and (3) test-retest reliability. Agreement between scores of the LAST by personal and informant’s interview (Spearman-Rho = 0.739, $p < 0.01$), joint interviews (ICC = 0.992, 95% CI = 0.984–0.996, $p < 0.0001$; $df = 32$), and test-retest interviews (ICC = 0.909, 95% CI = 0.817–0.956, $p < 0.0001$; $df = 28$) was high.

■ Estimating the validity of the LAST by using SCID-I (DSM-IV) as gold standard

The validity of the LAST for self- and proxy interview was assessed by calculating sensitivity and specificity using DSM-IV diagnoses of alcohol dependence or abuse obtained by SCID-I (defined as standard). The

LAST (7-item version, cut-off of 2 points) showed high sensitivity, high specificity, and high negative predictive power, but only moderate to high positive predictive power in the whole sample, suicides, and controls interviewed. The calculation of the area under the ROC curves revealed 0.96 (95 % CI 0.91–1.0) for controls and 0.95 (95 % CI 0.91–0.94) for suicides, which represents excellent accuracy of the LAST. Specificity, positive and negative predictive power were also high in controls by informant's interview (Table 1).

■ Comparison of the results of the LAST with alcohol-specific questions of the interview applied in the "Suicide in Finland 1987" project

Association between LAST scores and the alcohol-specific items of the Finnish interview was evaluated. LAST (7-item version) total scores and the scores of the items of manner, frequency, amount of alcohol use, and risk behaviour after alcohol consumption were significantly correlated (although numerical values were only moderate, Table 2).

■ Comparison of suicides and controls concerning alcohol abuse and dependence

Significantly, suicides were more often diagnosed with alcohol dependence (DSM-IV) relative to controls ($P < 0.0001$, $\chi^2 = 36.87$, d.f. = 1; Chi² Test, Table 3; OR = 8.8, 95 % CI 4.4–17.7). Frequency of alcohol abuse (DSM-IV) did not significantly differ between suicides and controls ($\chi^2 = 0.87$, d.f. = 1; Chi² Test, Table 3; OR = 2.5, 95 % CI 1.6–3.8). Suicides also had significantly higher LAST scores than controls (7-item version, $P = 0.004$, $Z = -2.90$; MWU Test; suicides: median: 0, 75 % percentile 2; controls: median: 0, 75 % percentile 1; Table 4). Total scores above the cut-off of at least two points on the LAST were significantly more often detected in suicides than in control subjects (29.4 % vs. 14.4 %, $P < 0.0001$, $\chi^2 = 16.82$, d.f. = 1; Chi² Test; OR = 2.5, 95 % CI 1.6–3.8).

Discussion

In our study, the validity of a short screening instrument, the LAST (Rumpf et al. 1997), was evaluated for

Table 2 Correlation between scores of the single questions out of the interview used in the Suicide Prevention Project in Finland (IMS-87) and the Luebeck Alcohol Dependence and Abuse Screening Test (LAST 7-item version, Kendall's tau-b) in suicides

	LAST 7-item version
How did he usually use alcohol?	0.519***
How often on an average did he use alcohol?	0.335***
The average amount of alcohol he consumed at a time during the last year?	0.431***
How often was he intoxicated during the last year?	0.602***
Sum of incidents which happened to him during the last year when using alcohol	0.512***

*** $P < 0.0001$

Table 3 Axis I diagnoses by SCID-I (DSM-IV) in suicides and controls (Chi² Test)

Axis I diagnoses	Suicides n = 163	Controls n = 396	P <
Any alcohol-related disorder	22.1 %	6.8 %	0.0001
Alcohol abuse	6.7 %	4.8 %	n. s.
Alcohol dependence	15.3 %	2.0 %	0.0001

Table 4 LAST scores (7-item version) in suicides (n = 163) and control persons (n = 396)

LAST total score	Suicides	Controls
0	63.1 %	70.5 %
1	7.5 %	15.2 %
2	5.0 %	7.6 %
3	6.9 %	4.5 %
4	5.0 %	1.3 %
5	5.6 %	0.3 %
6	4.4 %	0.8 %
7	2.5 %	0 %

postmortem assessment of alcohol consumption in suicides. The LAST is a screening instrument, which to date is predominately used in clinical settings (Rumpf et al. 1997, 1998). A basic question for validity studies is the reliability of the instruments; in our study, interrater and test-retest reliability of the LAST were high. Furthermore, our results revealed a high correlation between the scores by the interviewee's own report and the interview of a close person. Significantly, alcohol-related

Table 1 Validity measure of the LAST (7-item version, cut-off: 2) by DSM-IV diagnoses assessed by SCID-I (DSM-IV): alcohol abuse or dependence

	Sensitivity	Specificity	Positive predictive	Negative power
Whole sample	95.2 %	90.9 %	56.7 %	99.3 %
Suicides (n = 163)	94.3 %	88.8 %	70.2 %	98.2 %
Controls informant's interview (n = 35)	—	94.3 %	100 %	100 %
Controls personal interview (n = 396)	96.3 %	91.6 %	45.6 %	99.7 %

— no calculation of correlation measures because one variable is a constant in the 2-way-table

disorders were more often diagnosed in suicide victims than in controls. This finding replicates the results of other studies (Cheng 1995; Foster et al. 1999; Vijayakumar, Rajkumar 1999) with a marginally lower percentage of alcoholism in our study, in suicides as well as in controls. The frequency of alcohol abuse and dependence in control persons reveals a high correspondence with the prevalence rate for these disorders in Germany (Strobl et al. 2002).

A critical issue in estimating the validity of measures for alcohol abuse and dependence is the chosen 'gold standard' (i. e. Nielsen et al. 1994; Storgaard et al. 1994; Wetterling et al. 1998). Diagnoses obtained by standardized interviews like SCID-I (Spitzer et al. 1984) were very often accepted as 'gold standard'. As in the original study by Rumpf et al. (1997), our results showed a high sensitivity as well as a high specificity of the LAST using alcohol dependence or abuse diagnosed by SCID-I (DSM-IV) as 'gold standard'. Probably due to the small sample size of informant's interviews of controls, not a single control person was diagnosed with an alcohol-related disorder. Therefore, the sensitivity of the LAST could not be calculated for this group; thus, it needs further investigation to determine if alcohol abuse or dependence could be reliably detected by proxy interview. Yet, the good agreement, especially of specificity and negative predictive power between all three samples, provides evidence for the robustness of our findings. High sensitivity in the deceased as well as in the controls is not quite in accord with the results by Rumpf et al. (1997), who showed that the LAST was less sensitive in a general practice sample than in a general hospital sample, i. e. less sensitive in an obviously less ill population. The CAGE and thereafter the LAST are screening tests which are more sensitive to alcohol dependence than to less severe drinking problems (Fiellin et al. 2000). However, specificity and sensitivity also depend on the chosen cut-off (Rumpf et al. 2002). In contrast to Rumpf et al. (1997), we investigated the whole sample by SCID-I independently of their LAST scores. Some of the assessed persons, predominately controls, had LAST scores higher than 2, but could not be diagnosed with an alcohol-related disorder by SCID-I. Furthermore, low prevalence of alcohol abuse and dependence may contribute to high specificity and consistently high negative predictive power, but also to the varying positive predictive power in the three samples with lower values in control persons (Baldessarini et al. 1983). High specificity across all three groups indicates that false positives were minimally problematic.

Although the LAST and the questions concerned with the use of alcohol in the interview of the Suicide Prevention Project in Finland (IMS-87) show different structure and content, the total score of the LAST, 7-item version, was significantly associated with high, frequent, and hazardous alcohol consumption as determined by the IMS-87. The latter interview contains detailed questions with several alternatives, mainly about the suicides' alcohol consumption (e. g. frequency and amount

of alcohol consumption, preferred sort of alcoholic beverages, number of incidents when using alcohol), whereas the LAST consists of dichotomized questions, predominantly about the more clinical aspects of the consequences of alcohol consumption. Alcohol use and misuse occur on a continuum, and associated problems go far beyond actual diagnosable alcohol dependence (Heather 1994; Rohde et al. 1996). However, in post-mortem evaluation of risk factors for suicide, comprehensive analysis of different aspects of alcohol consumption are just as important as diagnoses of alcohol-related disorders. Thus, our results suggest that the complementary application of the LAST and the alcohol-specific questions of the IMS-87 is to be recommended to more fully comprehend suicides' alcohol consumption.

In summary, our results provide support for the validity of identifying individuals with alcohol dependence and abuse by the best-estimate method using the LAST. The relatively high positive predictive power of the LAST in suicides suggests that this instrument can be recommended as a time-saving screening instrument for the detection of alcohol abuse and dependence in suicides, since the items of the interview used in the National Suicide Prevention Project mainly assess frequency and quantity of alcohol consumption and do not provide a score usable for screening. If this screening tool detects alcohol dependence or abuse, these disorders can be precisely diagnosed by application of structured interviews for operationalized diagnostic systems. However, these instruments should also be assessed for the best-estimate method. One major weakness of the study is that sensitivity could not be calculated in controls assessed by informants' interview. This lack of assessment is caused by the low prevalence rate of alcohol dependence and abuse in the general population. But low prevalence rates are an unavoidable problem of reliability studies of psychiatric disorders with general population samples. In order to confirm our results future investigation should encompass a larger sample.

In conclusion, our results suggest that the Luebeck Alcohol Dependence and Abuse Screening Test assesses alcohol dependence and abuse by informant's interview. However, detection of alcohol use disorders is not only important in evaluation of risk factors for suicide in postmortem research. Diagnosing alcohol use disorders and having new effective and safe treatment options for alcohol-dependent patients (Soyka et al. 2002) is absolutely necessary for effective suicide prevention and can help to reduce suicide risk.

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